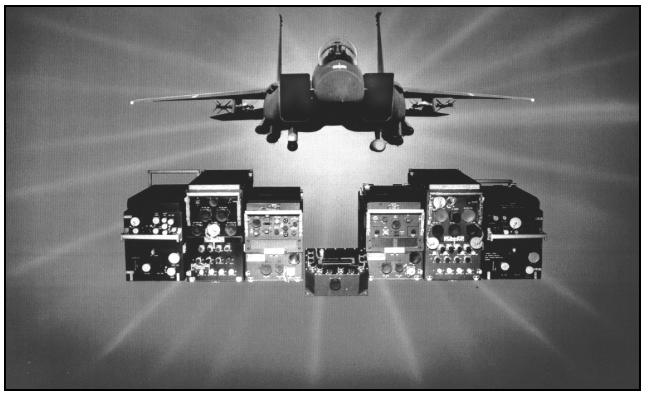
F-15 TACTICAL ELECTRONIC WARFARE SYSTEM (TEWS) (AN/ALQ-135 BAND 1.5)



SYSTEM DESCRIPTION

The F-15 Tactical Electronic Warfare System (TEWS) ALQ-135 Band 1.5 is an Air Force upgrade program that contributes to individual aircraft survival through improved air crew situation awareness of the radar guided threat environment, cueing both active and passive countermeasures in the Band 1.5 frequency spectrum, and adding a waveform select feature for jamming optimization against specific threats. TEWS consists of the ALR-56C radar warning receiver, the ALQ-135 internal countermeasures set, the ALQ-128 electronic warfare warning set, and the ALE-40/45 countermeasures dispenser. TEWS provides electronic detection and identification of surface and airborne threats and can provide active electronic jamming and dispensing of chaff and flares.

The ALQ-135 is an internally mounted responsive radio frequency jammer designed to counter surface-to-air and air-to-air threats with minimum aircrew activity. The Band 3 version of the ALQ-135 operates against threats at higher frequencies and has been fielded with the F-15E for over 11 years. It allows full interoperability and robust jamming techniques against modern Pulse-Doppler radar threat systems. The Band 1.5 improvement added the capability to operate against threats at lower frequencies. Band 1.5 is completely dependent on Band 3 for signal reception, processing, and interfacing with the rest of aircraft avionics. Future plans call for the integration of a Fiber Optic Towed Decoy (FOTD) to the existing TEWS system. The FOTD is based on Integrated Defensive Electronic Countermeasures (IDECM) technology and is currently scheduled for TEWS integration around 2005.

BACKGROUND INFORMATION

DOT&E TEWS oversight began in November 1990. In 1994, AFOTEC conducted an Operational Assessment (OA) of the F-15E and concluded the system would not likely pass IOT&E. In 1998, the Band 1.5 DT phase began, but was encumbered by software immaturity and integration problems with Band 3.0. IOT&E was conducted May-July 1999 and included 38 open-air range test sorties with over 84 flight hours (103 operating hours). Numerous re-sets, BIT false alarms, and unexplained in-flight faults occurred and seven deficiency reports were written by AFOTEC. In October 1999, as a result of those deficiency reports, the AFOTEC commander de-certified the system from IOT&E, leading to the year 2000 Combined DT/OT and IOT&E (referred to herein as 2000 IOT&E). This effort consisted of Installed System Test Facility (ISTF) operations in the Preflight Integration of

Munitions and Electronics System (PRIMES) anechoic chamber at Eglin AFB, and a series of 55 open-air range sorties at the Eglin AFB Multi-Spectral Test and Training Environment and the Nellis AFB Test and Training Range. In-plant testing of the new Operational Flight Program (OFP) was conducted during the period November 1999-February 2000. Based on this testing (including a re-evaluation of BIT performance) at the Northrup Grumman facility in Rolling Meadows, IL, the ALQ-135 was re-certified to enter its year 2000 IOT&E.

The 2000 IOT&E consisted of ISTF operations in the PRIMES anechoic chamber and a series of 55 open-air range sorties at Eglin AFB and Nellis AFB, totaling 109 flight hours (137 operating hours). Fifteen of the 55 sorties were dedicated to evaluation of the system's contribution to reducing the lethality of surface to air missile systems. Additional test sorties were added as opportunities arose to evaluate effectiveness against air-to-air missile systems. Twenty-eight sorties were flown to assess suitability improvements. Three operational aircraft from Nellis AFB, as well as one Eglin AFB instrumented aircraft, participated in this test sub-phase. Twelve sorties were flown at Nellis AFB under operationally realistic conditions involving air-to-ground ordnance release and the use of chaff and maneuvers to accompany active ALQ-135 jamming.

TEST & EVALUATION ACTIVITY

The only activity during FY2001 was the release of the DOT&E BLRIP report, discussed below.

TEST & EVALUATION ASSESSMENT

DOT&E concludes that the system is operationally effective but not suitable (see the B-LRIP report to Congress dated December 2000 for more detail).

Results of the 2000 IOT&E indicate that the ALQ-135 is effective as measured by the system's capability to reduce the lethality of those SAM systems required by Air Combat Command. However, the ALQ-135 threshold criteria for effectiveness focused only on Band 1.5 and does not address the newer SAM systems. Effectiveness of the entire TEWS against air-to-air systems and its capability to engage multiple high duty cycle type threats remain to be evaluated. The addition of Band 1.5 equipment to the existing TEWS adds value to the self-protection capability of the F-15E and completes the TEWS suite as originally designed.

Reliability, Maintainability, and Operational Availability do not meet System Operational Requirements Document specified thresholds and objectives. Suitability of the ALQ-135 depends on the capability of the BIT to identify faults, enabling timely corrective action. The OFP changes made to improve BIT were ineffective; BIT false alarm rate is 65 percent. The BIT system for the ALQ-135 is the only means available for the aircrew to establish readiness of the system prior to entering a threat area. An excessive false alarm rate (e.g., ≥ 20 percent) causes not only an unwarranted number of maintenance actions, but also distracts aircrew attention from primary mission functions.

Operational Availability (Ao) is a measure of the system's readiness for use when needed (uptime) as compared to total "ownership" time (uptime plus downtime). Ao was 80 percent based on Follow-On DT/OT data compared to the 63 percent estimate achieved during the 1999 IOT&E. The Air Combat Command objective for Ao is greater than 96 percent.

An additional shortfall with the TEWS system is a longstanding problem with the ALR-56C Radar Warning Receiver. In a dense signal environment, ALR-56C lacks adequate processing capability, as evidenced by incomplete and/or slow display of threat emitters to aircrews.

Because the Band 1.5 equipment adds an important capability, production was continued in spite of these shortcomings. BIT and reliability improvements, and Follow-on OT&E (FOT&E) are needed. The addition of a Fiber Optic Towed Decoy (Suite 5) will require a dedicated IOT&E. A full up, comprehensive ALQ-135 system level OT&E should be conducted prior to production and fleet release of the FOTD suite.

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